

INDOOR AND OUTDOOR SPACES DESIGN QUALITY AND ITS CONTRIBUTION TO SUSTAINABLE HOSPITAL BUILDINGS

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Summary

The hospital project contains different aspects from the most common projects of residential, offices or services buildings. In common buildings, sometimes the user and the client are the same and when they are not, setting the requirements is not difficult since they are common to most inhabitants. In the case of hospital buildings this is not the reality and the project team is usually hired for the purpose of designing a building that includes different spaces and different users, such as doctors, nurses, patients, visitors, cleaning staff, etc. In this sense it is important to combine different spatial needs, which are always subject to constant changes throughout its period of use due to new features, innovations, needs expansion and new treatment methods. This paper aims to study the importance of the space design in the sustainable construction of hospital buildings

Keywords: assessment, design, hospitals, sustainability

1 Sustainability in healthcare

The hospital buildings, not because they are more abundant in the territory, but because they are large consumers of natural resources and energy, should be a major focus of study in the evaluation process of the buildings life cycle [1]. On the other hand it is necessary to take into account the use of renewable and non-renewable resources, disposable products, toxic substances and the production of a large quantity of waste [2].




The healthcare providers are not serving patients but serving people. It is their role to design and deliver services to meet the needs of normal people at the most difficult times in their lives [3]. The hospital project, more than any other, requires a number of concerns with the satisfaction and well being of working teams, patient, administration and other officials. These are buildings that include several functions, which makes the radius of action very comprehensive and increases the complexity of work [4]. In this context its possible to say that the design phase is the most comprehensively addressed portion of the life cycle in most sustainable building guidelines and evaluation methods [5]. The space and volumes organization are very important for different areas and can be decisive in environmental, economic and social development of the whole building.

Based on this context, this paper will study how the space design quality is addressed in the hospital buildings rating systems.

2 Improving healthcare with better spaces design quality

Healthcare is one of the most complex and rapidly changing industries. It is continually transformed by new technologies, technique, pharmaceuticals and delivery systems [6]. Consequently the construction of this type of buildings needs to incorporate this evolution and the design of the spaces can be the way to improving healthcare. The architectural design of the space, its organization, operation and configuration, allow these buildings to responding and adapt positively to the needs for which they are designed. A good investment in their flexible design at an early stage reduces the need for further improvements [7]. Analysing the indicators and parameters of the assessment tools of the sustainable construction, specific to hospital buildings, it is possible to grasp the concern and seek to use these methodologies in the architecture design phase allows the existence of more sustainable buildings in the future. Many of these parameters are easily answered through the spatial and volumetric organization of indoor and outdoor spaces. So it is important to encourage the architects to incorporate these concerns in their projects, avoiding solving future problems with the addition of equipment or other solutions that increase energy consumption, water, or other resources, even human. The sustainable evaluation has been very addressed in order to classify comparatively buildings. Nevertheless it is of increasingly importance that such methods area regarded as ordinary work tools in all phases of the project. Table 1 show some choices of spatial and volumetric organization taken in buildings of recognized quality in terms of sustainability.

Tab. 1 Example of design options in three case studies

Case study	Description
	<u>Providence Newberg Medical Centre</u> <ul style="list-style-type: none"> • Recognition: US Green Building Council LEED (Gold level); distinction in 2007 Hospitals for a Healthy Environment (H2E) - Environmental Leadership Award. • Design option: to implant the building in two volumes in “V” shape. It favors the existence of green spaces, energy efficiency, visual comfort and rainwater use.
	<u>Evelina Children Hospital</u> <ul style="list-style-type: none"> • Recognition: NHS Building Better Health Care Award for Hospital Design, November 2006; the project team has earned the Royal Institute of British Architects design competition. • Design option: to remove the partition walls between the rooms and the circulation areas. It decreases the footprint, increases the net floor area and allows greater comfort in use by clients and employees.
	<u>Boulder Community Foothills Hospital</u> <ul style="list-style-type: none"> • Recognition: First hospital certified by US Green Building Council LEED, in the E.U.A. (Silver level); distinction in 2006 Hospitals for a Healthy Environment (H2E) - Environmental Leadership Award. • Design option: to reduce the car parking area and to create adequate parking areas and paths for bicycles, in order to encourage the use of alternative transportation.

2.1 Assessment tools for the hospital buildings

There are a growing number of sustainable assessment tools developed for the building sector all over the world and oriented for new constructions, existing buildings and refurbishment/rehabilitation operations. Inside these three groups, most assessment tools are specifically oriented for different type of buildings. In the context of hospital buildings the most well known tools are: BREEEM Healthcare, LEED for Healthcare and Green Star – Healthcare. Table 2 presents the sustainability parameters of the abovementioned tools that are directly influenced by the indoor and outdoor spaces design quality. Figure 1 shows with light grey the relevance (in percentage) of these parameters in the overall sustainable score.

Tab. 2 Sustainability parameters that are directly influenced by the indoor and outdoor spaces design quality

Category	Parameters	BREEEM Healthcare	LEED for Healthcare	Green Star-Healthcare
Sustainable Sites	Light Pollution Reduction		x	
	Connection to the Natural World - Places of Respite		x	
	Connection to the Natural World - Direct Exterior Access for Patients		x	
Health & Wellbeing	Day lighting	x	x	x
	View Out	x	x	x
	Potential for Natural Ventilation	x		x
	Outdoor Space	x		x
	Arts in Health	x		
	Minimum Indoor Air Quality Performance		x	
Energy	Optimize Energy Performance		x	
	Lighting zoning			x
	Car park ventilation			x
Transport	Proximity to amenities	x		
	Pedestrian and Cyclist Facilities	x	x	x
	Maximum Car Parking Capacity	x		x
	Deliveries and Maneuvering	x		
	Community Mass-transports			x
	Transport design and planning			x
Materials and Resources	Compactor / Baler	x		
	Storage and Collection of Recyclables		x	
	Resource Use - Design for Flexibility		x	
Land Use & Ecology	Reuse of Land	x		x
	Contaminated Land	x		x
	Mitigating ecological impact	x		x
Innovation in Design	Innovation	x		x
	Integrative Project Planning and Design		x	
	Innovation in Design: Specific Title		x	
	Integrative Project Planning and Design		x	

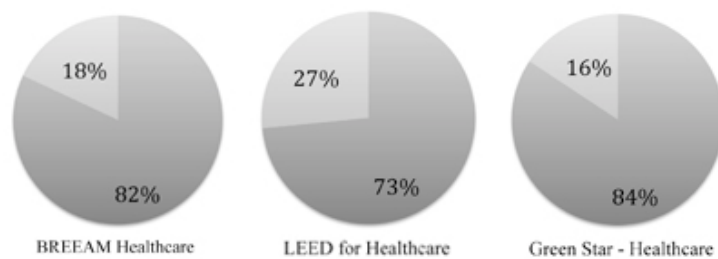


Fig. 1 The relevance of the outdoor and indoor spaces' design quality (in percentage) in the overall sustainable score (represented in light grey)

3 Discussion and Conclusions

The Hospital architecture has a strong social responsibility and impact on the city. Mostly due to various design requirements, these buildings are not designed and operated in a sustainable way. Based on this context it is important to study the best practices in architecture that should be taken into account in the design phase (to support the decision to adopt solutions that contribute to the building sustainability). It is relevant to promote and discuss the importance of the space organization to the sustainable construction and the influence of the architecture in the BSA tools. This paper shows that this aspect is not adequately addressed in most important BSA tools, since there is only one parameter that is directly related with it: Innovation in Design. Future developments on BSA tools should give more weight to this aspect of major influence in the building life-cycle performance.

Acknowledgement

The authors acknowledge the Portuguese Foundation for Science and Technology for the financial support under Reference SFRH/BD/77959/2011.

References

- [1] GUENTER, R., VITTORI, G. *Sustainable healthcare architecture*. New Jersey: JW&S, 2008.
- [2] SHORT, C., AL-MAIYAH, S. "Design strategy for low-energy ventilation and cooling of hospitals" *Building Research & Information*, 37(3), Jun.2009, p.264–292.
- [3] CLARK, P., MALONE, M. "What Patients Want: Designing and Delivering Health Services that Respect Personhood," in *Improving healthcare with better building design*, 1(2), MARBERRY, S., Chicago: HAP, 2006, p.15–35.
- [4] DIAS, M. "Resíduos dos serviços de saúde e a contribuição do hospital para a preservação do meio ambiente," *Academia de Enfermagem*, Jan-2004, pp. 21–29.
- [5] BUNZ, K., HENZE, G., TILLER D. "Survey of Sustainable Building Design Practices in North America, Europe, and Asia." *Journal of Architectural Engineering*, 12(1), 2006, p.33–62.
- [6] BOONE, T. "Creating a Culture of Sustainability. Leadership, Coordination and Performance Measurement Decisions in Healthcare," *Health Care Research Collaborative*, Chicago, Mar-2012, p.1–32.
- [7] JOHNSON, S. "Summarizing Green Practices in U.S.Hospitals" *Hospital Topics*, 88(3), 2010, p.75–81.